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(54) IMPROVEMENTS IN OR RELATING TO ROTARY ATOMISERS

(71) I, EDWARD JULIUS BALS, an Austrian citizen, of Delamere House, Tedstone Delamere, Bromyard, Herefordshire, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to rotary atomisers of the kind which include a rotary dispersion member on to which liquid to be atomised is fed, rotation of the dispersion member resulting in migration of the liquid to the periphery of the dispersion member and the issuance of a stream of droplets from said periphery.

According to the invention an atomiser comprises a dished rotary dispersion member having a substantially planar circular central region with a peripheral frusto-conical wall inclined outwardly from the central region, the inner surface of the frusto-conical wall being formed with grooves extending radially outwardly from the central region to the innermost free edge of the wall and the member being adapted for driving engagement by rotary drive means.

The atomiser preferably includes a non-rotary member disposed in close proximity to the inner surface of the frusto-conical wall and means for feeding liquid to be atomised into the gap between the frusto-conical wall and the stationary member.

An embodiment of the invention will now be be described, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is a sectional view of an atomiser,

Figure 2 is a sectional view of a rotary dispersion member of the atomiser, and

Figure 3 is a plan view of a portion of the edge of the rotary dispersion member.

The atomiser includes a body 1 in which is mounted a low-voltage electric motor 2 with its axis of rotation inclined at about 45° to the vertical when in the operating position, as shown in Figure 1. A cover 3 is provided for the upper end of the motor 2 which projects from the body 1. The end portion 4 of the body 1 remote from the cover is of frusto-conical form and has a central aperture 23 through which projects a drive shaft 5 of the motor 2.

Mounted on the drive shaft 5 is a rotary dispersion member 6, hereinafter termed a disc, comprising a central portion 7 and a peripheral wall 8 inclined at an angle of, for example, 60° to the plane of the flat portion 7 so as to follow the contour of the frusto-conical portion 4, the spacing therebetween being of the order of 0.03." The flat central portion has a diameter substantially half that of the outermost edge of the frusto-conical wall. The disc 6 is formed as a one-piece moulding from a synthetic plastics material and includes an axially bored central boss 9 having internal lugs 10 for snap engagement with the drive shaft 5. The inner surface of the wall 8 is provided with grooves 11 extending outwardly along the wall away from the central region towards the free edge of the wall and effectively acting as a reservoir which releases liquid, when in use, at a controlled rate, depending on the rate of rotation of the disc 6 and the inclination of the wall 8.

By forming a large number of grooves 11 in the wall 8, for example 360, and by appropriately selecting the inclination of the wall 8 to the plane of the central portion 7 of the disc 6, the liquid issues from the outermost edge of the disc in the form of very fine even-sized ligaments.

The peripheral wall 8 of the disc 6 is formed at its outermost edge with a series of radially outwardly projecting teeth 12,

the teeth 12 being disposed at the same spacing as the grooves 11 in the inner surface of the wall 8. The teeth 12 and grooves 11 are positioned relatively to one another such that the base of each groove 11 is in radial alignment with the apex of a corresponding tooth 12 and thus, when one considers any point on the circumference of the free end of the wall 8, the distance between the radially inner edge and the radially outer edge thereof is substantially constant. As a result, a stream of liquid travels from the end of each groove 11 to the apex of the adjacent tooth 12 thereby ensuring that the liquid issues as a plurality of discrete ligaments and does not coalesce to form a single sheet of liquid at the periphery of the disc 6.

The body 1 includes a circumferential shoulder 13 adjacent the edge of the disc 6, which serves to shield the teeth 12 from damage and also to protect the hands of an operator from damage by the teeth. Formed integrally with the body 1 is a tube 14 extending, when the atomiser is in the operative position, vertically upwardly from the main portion of the body. At its upper end, the tube 14 carries a member 15 internally threaded for attachment to a liquid reservoir bottle (not shown). The thread 19 in the member 15 is sufficiently deep to allow air to travel along the base of the thread 19 and enter the reservoir bottle when fitted to provide a constant head of liquid. The tube 14 is provided with an insert 16 of tubular form having a calibrated orifice 17 at its lower end and a flange 18 at its upper end for location of the insert 16.

A groove 20 in the frusto-conical surface of the body end portion 4 communicates with a bore 21 in the body 1, which bore 21 in turn communicates with the interior of the tube 14. A labyrinth seal 22 is provided between the flat portion 7 of the disc 6 and the central region of the body end portion 4 to seal the gap between the inclined wall 8 and the body end portion 4 from the aperture 23.

In operation of the atomiser, the disc 6 is rotated at a speed of the order of 15000 r.p.m. by the motor, and a boundary layer of air adjacent the inner face of the wall 8 is carried around with the disc 6 and is centrifugally thrown outwardly along the grooves 11 to the periphery of the disc 6 where it escapes. To replace the air ejected in this manner, air in a boundary layer adjacent the frusto-conical surface of the body end portion 4 travels inwardly towards the labyrinth seal, as does any air in the groove 20, before it is caught up in the outwardly travelling boundary layer and ejected. Orifice 17 meters into tube 14 a controlled flow of liquid which travels parallel to the incoming air along the groove 20 and then follows the path indicated by the arrow 24 in Figure 2.

Once the liquid has become entrained in the moving boundary layer, it is flung to the bases of the grooves 11 by centrifugal force and travels outwardly to the ends of the grooves 11 and across the end face 25 of the disc 6 to the apexes of the teeth 12, which it leaves in the form of very fine ligaments which subsequently break up to form droplets of the order of 40 microns in diameter.

The dimensions of the disc 6 and the rate of rotation of the disc 6 are so chosen as to obtain the required degree of atomisation whilst ensuring that the power required to achieve this is not excessive. The arrangement may be such that a motor input of less than 1 watt is obtained whereby batteries can be used which have a life in excess of 30 hours. A typical rate of spraying for agricultural purposes is between half and one litre per hour with the liquid sprayed over an area of between fifteen and twenty five acres.

WHAT I CLAIM IS:—

1. An atomiser comprising a dished rotary dispersion member having a substantially planar circular central region with a peripheral frusto-conical wall inclined outwardly from the central region, the inner surface of the frusto-conical wall being formed with grooves extending radially outwardly from the central region to the innermost free edge of the wall and the member being adapted for driving engagement by rotary drive means.

2. An atomiser according to claim 1, wherein the peripheral wall is formed at its outermost edge with radially outwardly projecting teeth.

3. An atomiser according to claim 2, wherein the teeth are disposed at the same angular spacing as the grooves.

4. An atomiser according to claim 3, wherein the apex of each tooth is in alignment, along a radius of the dispersion member, with the base of a corresponding groove.

5. An atomiser according to any preceding claim, wherein the substantially planar central region has a diameter substantially half that of the outermost edge of the frusto-conical wall.

6. An atomiser according to any preceding claim, including a non-rotary frusto-conical member, the outer surface of which is disposed in close proximity to the inner surface of the rotary dispersion member.

7. An atomiser according to claim 6, including means for feeding liquid to be atomised into the gap between the non-rotary member and the frusto-conical wall,

comprising a bore providing communication between the surface of the non-rotary member and liquid reservoir connecting means.

8. An atomiser according to claim 7, wherein the bore opens into a groove provided in the outer surface of the non-rotary member.

9. An atomiser according to claim 7 or 8, wherein the liquid reservoir connecting means includes liquid metering means.

10. An atomiser according to any one of claims 6 to 9, wherein cooperating elements of a labyrinth seal are formed on adjacent faces of the rotary dispersion member and the non-rotary member.

11. An atomiser according to any preceding claim, wherein the frusto-conical wall of the rotary dispersion member is inclined at an angle of substantially 60° to the plane of the central region of said member.

12. An atomiser substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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2 SHEETS

COMPLETE SPECIFICATION

This drawing is a reproduction of the Original on a reduced scale.
SHEET 1

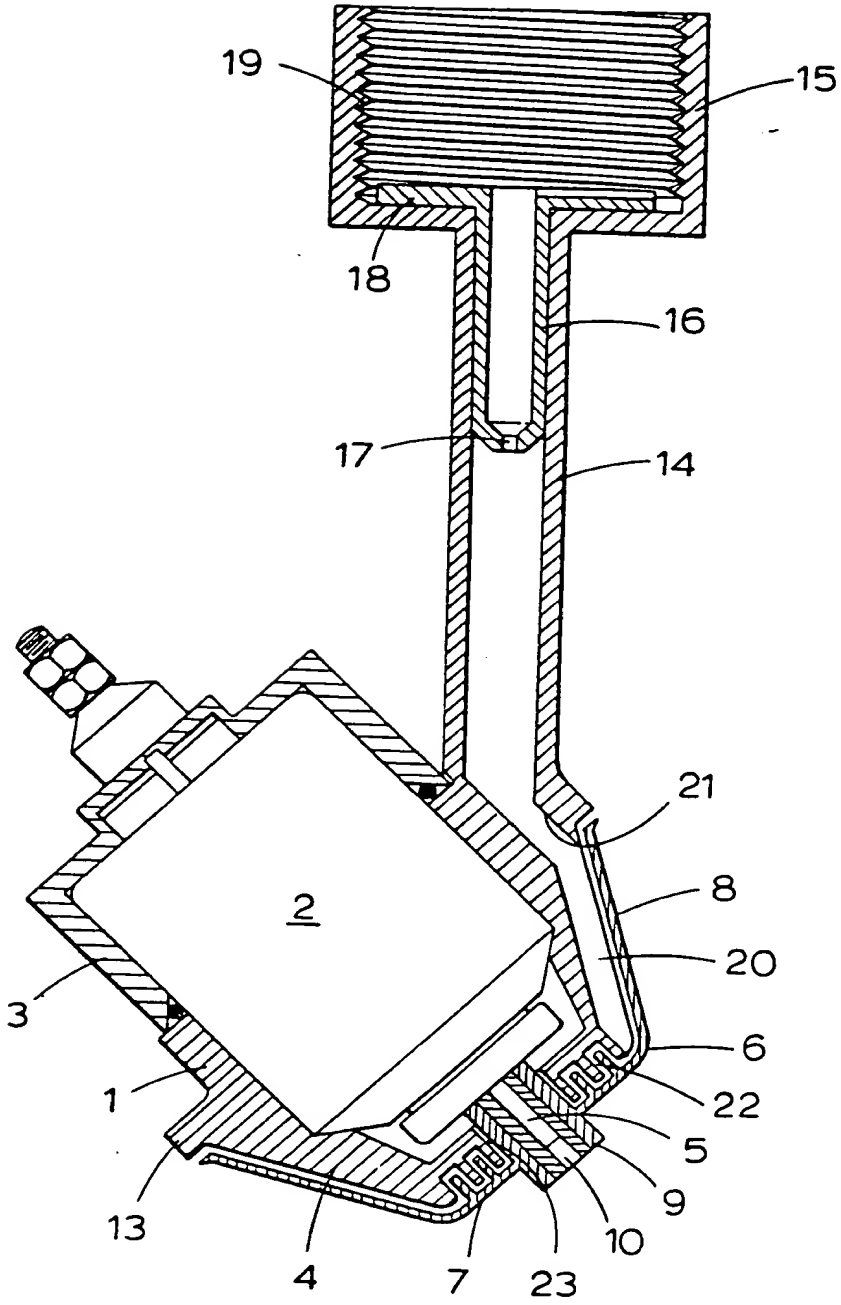

Fig. 1

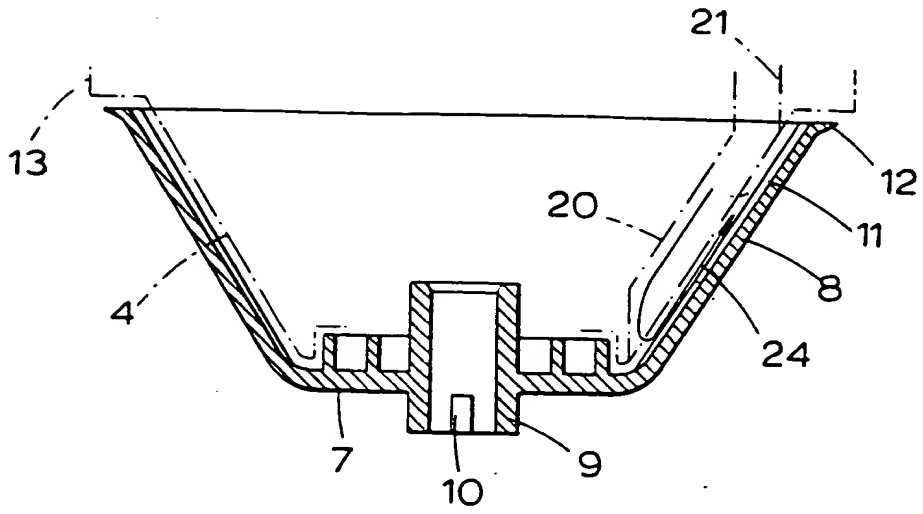

Fig. 2

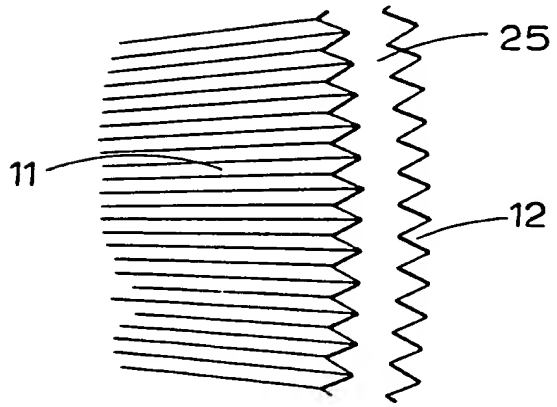

Fig. 3